Evolution of Middleware: Towards Agents

Distributed Systems
Sistemi Distribuiti

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Towards Seamless Agent Middleware

The first question

- How are we going to *implement the paradigm shift*, under the heavy weight of legacy?

Mainstreaming Agent Technologies

[OR04]

- Observing the state of agent technologies nowadays
- Focussing on agent middleware
- Devising out a possible scenario

The Technology Life-Cycle

A successful technology from conception to abandon

- First ideas from research
- Premiere technology examples
- Early adopters
- Widespread adoption
- Obsolescence
- Dismissal

Often, however, this does not happen

- New technologies fail without even being tried for real
- Which are the factors determining whether a technology will either succeed or fail?

Dimensions of a Technology Shift

Technology scenario has at least three dimensions

- Programming paradigm
  - new technologies change the way in which systems are conceived
- Development process
  - new technologies change the way in which systems are developed
- Economical environment
  - new technologies change market equilibrium, and their success is affected by market situations

3-D space for a success / failure story

- What will determine the success / failure of agent-based technologies?

The Programming Paradigm Dimension

Pushing the paradigm shift

- Evangelists gain space on media
- Technological geeks follow soon
- Drawbacks
  - too much hype may create unsupported expectations
  - perceived incompatibility with existing approaches
  - possible dangers for conceptual integrity

Middleware for the paradigm shift

- Technology support to avoid unsupported claims
- Seamlessly situated agents vs. wrapper agents
  - communication actions towards agents
  - pragmatical actions towards objects
- This allows agents to be used in conjunction with sub-systems adopting different component models

The Development Process Dimension

Accounting for real-world software development

- Availability of development methods & tools is critical
  - No technology is to be widely adopted without a suitable methodological support
- Day-by-day developer's needs should be accounted, too

Agent-Oriented Software Engineering Methodologies

- Adopting agent-based metaphors and abstractions to formulate new practises in software engineering
- Current state of AOSE methodologies
  - early development phases are typically well-studied
  - later phases are not, neither the tools, nor the fine-print details

The Economical Environment Dimension I

Innovation has to be handled with care

- Stakeholders of new technologies may enjoy advantages of early positioning
- However, they often focus too much on *novelty* and *product*, rather than on *benefits* and *service*
  - "We are different" alone does not help much
  - software is a quite peculiar product: nearly zero marginal cost, and almost infinite production capability

The Economical Environment Dimension II

Agent-Oriented Middleware & Infrastructures

- Promoting agent-oriented technologies through integration with existing object-oriented middleware & infrastructures
- Creating a no-cost space for agent technologies
- Notions like e.g. *ontology* or *coordination as a service* [VO06], which are made available to components of any sort
  - where (agent) technologies are no longer "sold" as whole packages
  - whose choice do not require any design commitment
  - where however agents represent the most effective choice for most components
- allow agent metaphors to add their value to existing systems with no assumption on the component model

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